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CONTENTS.

K. E. J. Barrett

A Survey of the Distribution and Present Status of the Wood Ant, *Formica rufa* L. (Hym., Formicidae), in England and Wales

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TRANSACTIONS OF THE SOCIETY FOR BRITISH ENTOMOLOGY

VOL. 17 MARCH 1968 PART VIII

A Survey of the Distribution and Present Status of the Wood Ant, *Formica rufa* L. (Hym., Formicidae), in England and Wales

By K. E. J. Barrett
(129 Smiths Lane, Windsor, Berks.)

Four species of the *Formica rufa* group of ants have been recorded in Britain. *F. rufa* L. occurs widely throughout England and Wales. *F. pratensis* Retz. is on the verge of extinction in England and is reduced to a single locality in Dorset. *F. lugubris* Zett. overlaps with *F. rufa* in Northern England and Wales. Both *F. lugubris* and *F. aquilonia* Yarrow occur in Scotland and, less abundantly, in Ireland.

F. rufa, the subject of the present survey, is largely confined to woodland areas and in such places is often the dominant terrestrial insect. However, the close relationship with a wooded environment and the prominence of the characteristic vegetable mound nests it inhabits, makes it a species particularly sensitive to the ever-increasing human pressures on its habitats.

A survey of the distribution of *F. rufa* in South-East England has been recently reported (Barrett and Felton, 1965). The distribution was described by a system based on the ten kilometre squares of the Ordnance Survey and that method has been followed in the present work. The vice-county distribution list for *F. rufa* was given, without locality details, by Donisthorpe (1927) and more recently a revised list, which takes account of the revision of the *rufa* group of species (Yarrow, 1955), has also been produced (Collingwood and Barrett, 1964, 1966). A more detailed survey has been given by Nelmes (1938) and by Yarrow (1955), but comparatively few of the records listed were known to be contemporary. In the present survey, confirmation of at least one previously recorded locality in each ten kilometre square has been attempted and likely areas in other squares from which records have not been previously reported were also examined.

Distribution Tables and Map

Localities of the records obtained have been assembled according to the ten kilometre squares within the vice-county divisions in Table 1. Localities in which the species has been recorded or confirmed since 1950 are marked * (symbol • in distribution map). Previously recorded localities in which the species has been looked for since 1950 but not confirmed are

marked † (symbol ⊙ in map). Localities in which the present status of the species is still unknown are unmarked (symbol o in map).

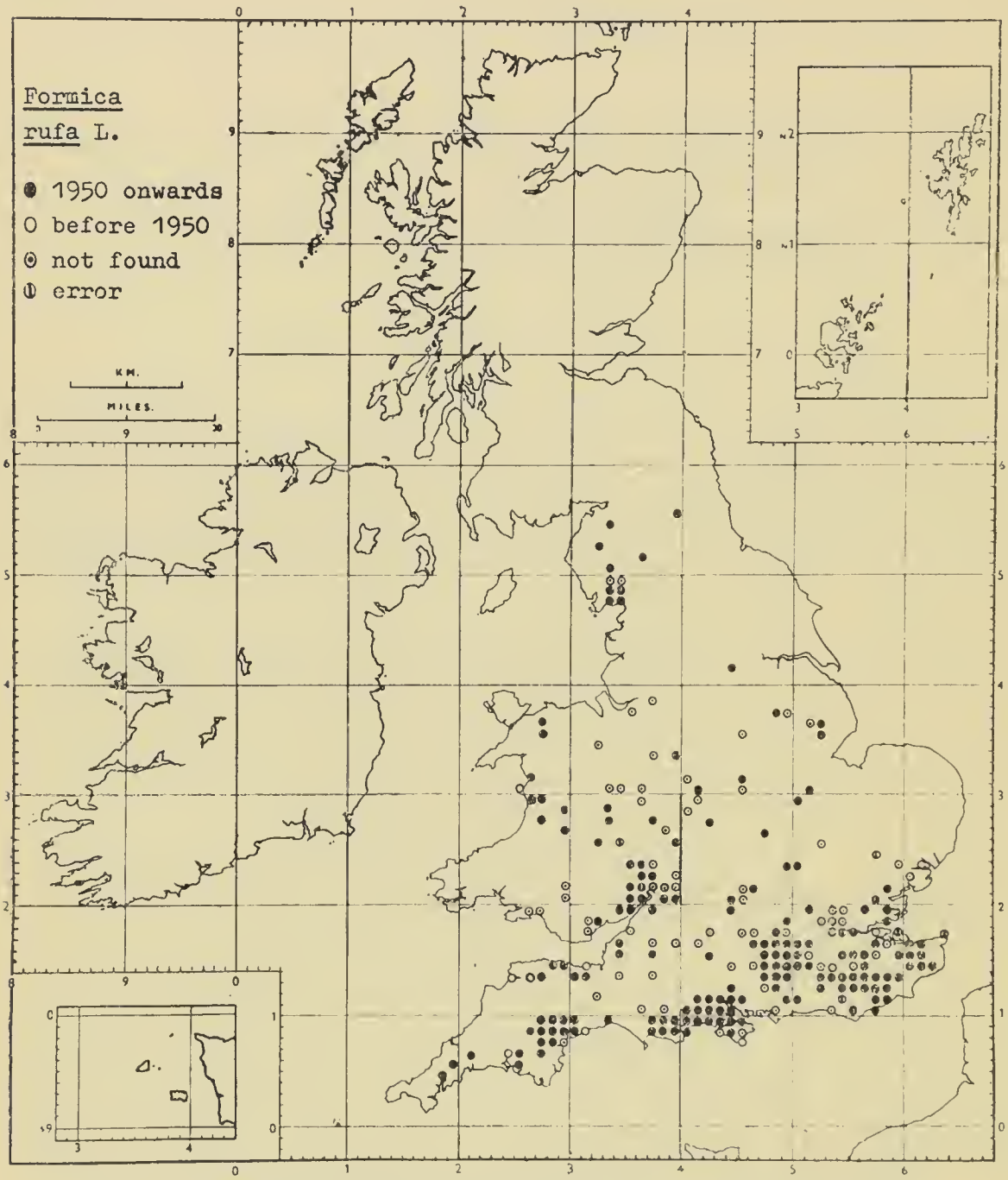

Figure 1. Ten kilometre square distribution of *Formica rufa* L.

A number of published records for *F. rufa* were in error. Some early records for a myrmecophilous ladybird, often but not exclusively taken in nests of the wood ant, have been presumed by later authors to indicate the presence of the host species. Such records for South-East England have been discussed previously (Barrett and Felton, 1965). Similar assumptions have been made for early records of the ladybird from Birdbrook (TL 74), Essex (Rye, 1870) and Leominster (SO 45), Hereford (Newman, 1847). Such records have not been included in the distribution tables but are denoted in the distribution map (Figure 1) by the symbol

Ø). An early record for East Norfolk, cited by Yarrow (1955), without locality, has not been included.

A summary of the distribution and status of the species in the ten kilometre squares of the vice-counties is given in Table 2. The ten kilometre square distribution and status of the species on the main geological substrates of England and Wales is summarised in Table 3. Literature references to the distribution of *F. rufa* have been compiled in Table 4, according to vice-county divisions. Earlier references cited previously by Nelmes (1938) have not been included.

Details of the distribution were supplied to Dr. F. H. Perring of the Biological Records Centre of the Natural Environment Research Council who produced the ten kilometre square distribution map illustrated in Figure 1.

Discussion

Formica rufa L. is confined in Britain to England and Wales. Although it occurs widely throughout this region the main concentrations of records are grouped on well-drained soils in Southern England (Figure 1). These areas include the wooded valleys around Dartmoor, the sandy heaths of Dorset and Hampshire and well-drained, wooded areas of South-East England and the Severn Valley. All these areas are characterised by records from many localities which, in general, have been readily confirmed in the present survey (Tables 1, 2). The disappearance of the species from localities in these areas can usually be ascribed to increasing urban pressures on its habitat as, for example, around the London area. In between these areas of concentrated records in Southern England and further northwards throughout the Midlands, Wales and Northern England records become more scattered and incidence of extinction of the species from these localities becomes significantly higher. Clearly, away from the main centres of concentrated records, the chance of recolonisation of extinct sites is remote.

In Table 1 and Figure 1, records obtained since 1950 have been taken as valid. However, in some of the sites listed, the species is known to have disappeared during the period of this survey. For example, at Tubney (SU 49, SP 40) in Berkshire the species has not been seen since 1962, and at Wentbridge (SE 41) in Yorkshire the species has recently disappeared. Similar disappearances might have occurred in other isolated localities during the present survey, especially where colonies were few in numbers as at Hinton Charterhouse (ST 75) in Somerset.

The high incidence of records on sandy substrates was noted by Nelmes (1938) and it was concluded that the ants required an acidic substrate on which to flourish. Satchell and Collingwood (1955) showed that the species occurred most abundantly on limestone in the English Lake District and regarded the thermal influence of the substrate on the micro-climate of more significance than its acidity. The distribution and status of *F. rufa* L. on the

main geological substrates found in the present survey is summarised in Table 3. The number of records on sands and other non-calcareous soils was high and a large proportion of the records was confirmed in the present survey. A smaller fraction of confirmed records were obtained on clays but many of the extinctions in this case can be directly ascribed to the destruction of habitats by building operations around the large urban areas, particularly on the London clay. However, a significant proportion of confirmed records were obtained on calcareous soils in the present survey. Although the species has disappeared from a number of places on flinty-clays overlying chalk on the Wiltshire and Hampshire Downs, it is still present at Ludgershall (SU 25) in Wiltshire and at Long Sutton (SU 74) in Hampshire on these formations. In Kent, the species is still abundant in a number of areas on chalk as at Challock (TR 04, TR 05). The confirmed localities on limestone was also high as, for example, in the Severn Valley.

The overall picture of distribution therefore shows a general trend of reduction in the number of scattered localities and this trend will probably continue in the future until only the main areas of concentrated records survive. In these latter areas the future status of the species is probably secure except in those places surrounding future urban expansions. Fortunately, many sites are in Forestry Commission and similar woodlands where the habitats are reasonably secure unless drastic changes in woodland management take place in the future.

TABLE 1

Distribution and status of *Formica rufa* L. in England and Wales.

West Cornwall

SW 84: Idless*, Truro*.

East Cornwall

SW 95: Grampound Road*.
SX 16: Bodmin*.

South Devon

SX 46: Virtuous Lady Mine.
SX 55: Marsh Mills, Plym Bridge*.
SX 56: Bickleigh Vale, Shaugh Bridge, Plym Forest*.
SX 68: Gidleigh Park*, Chagford Valley*
SX 76: Dean Wood, King's Wood, Hembury Wood*, Buckfastleigh.
SX 77: Webburn Valley, Holne Bridge*, Buckland in the Moor, Yarner Wood*.
SX 78: Lustleigh*, Lustleigh Cleave*, Clifford Bridge*, Bridford Wood*.
SX 79: Drewsteignton*, Fingle Bridge*.
SX 87: Bovey Tracey, Bovey Forest*, Kingsteignton, Gappah Brake*, Sandygate*.
SX 88: Bridford Wood*, Canonteign Wood*. Haldon Moor, Lower Ashton*.
SX 89: Longdown*, Oldridge Wood*, Whitestone Wood*.
SX 97: Teignmouth†, Dawlish†.

SX 98: Kenton*.
SX 99: Fordlands, Stoke Woods*, Huxham Brake*.
SY 08: Exmouth, Budleigh Salterton*.
SY 09: Harpford Common*.
SY 18: Sidmouth.

North Devon

SS 43: Croyde.
SS 63: Barnstaple
SS 73: South Radworthy*.

South Somerset

SS 84: Porlock*, Ashley Coombe*, Culbone*.
SS 94: Dunkery*, Exmoor, Minehead, Dunster*.
ST 03: Roadwater*.
ST 13: Nether Stowey, Over Stowey*.
ST 14: Holford
ST 21: Bickenhall†.

North Somerset

ST 43: Street†.
ST 45: Cheddar*, Winscombe*.
ST 46: Congresbury*, Cleeve*, Cleeve Toot*. Brockley†.
ST 57: Bristol†.
ST 75: Hinton Charterhouse*.
ST 76: Limpley Stoke†.

North Wiltshire

ST 96: Whetham†.
SU 16: West Wood†.
SU 27: Rabley Wood†.

South Wiltshire

ST 73: Selwood Forest†.
SU 21: Hamptworth*.
SU 25: Ludgershall*.

Dorset

SY 39: Lyme Regis*.
SY 78: Osmington, Galton, West Knighton Heath, Warmwell, Owermoigne Heath, Redbridge*.
SY 79: Higher Bockhampton, Yellowham Heath, Woodsford, Clyffe, Puddleton Heath*.
SY 88: Lulworth Cove, Moreton, Wool Heath, Coombe Heath, Povington Heath, Highwood Heath, East Stoke, Bovington Heath, Coombe Wood, Coombe Keynes, East Lulworth*.
SY 89: Affpuddle*, Bloxworth*, Bere Heath, Hyde, Woolsbarrow.
SY 98: Holme Heath, Grange*, East Holme*, Stoborough Heath, Furzebrook*, Middlebere Heath, Slepe Heath, Corfe, Wytch Heath, Arne Heath*, Bushey, Rempstone Heath*.
SY 99: Morden Park*, Stony Down*, Gore Heath*, Lytchett Minster*.
SZ 08: Newton Heath, Godlingstone Heath, Studland*, Sandbanks, Branksome Chine, Canford Cliffs*.
SZ 09: Broadstone*, Canford Heath*, Talbot Woods*, Dudsbury.
ST 60: Glanvilles Wooton†.
ST 80: Blandford†.
SU 00: Colehill*, West Moors, Ferndown*.

Isle of Wight

SZ 38: Norton†.
SZ 48: Forest Side*.
SZ 49: Parkhurst Forest*.
SZ 57: Ventnor, Landslip.
SZ 58: Shanklin Chine†.
SZ 59: Woodside, Firestone Copse*, Wootton.

South Hampshire

SZ 09: Meyrick Park, Bournemouth, Parley Common*.
SZ 19: Hurn, Sopley, Avon Heath, Pussex Common*, Bransgore*.
SZ 29: Hinton Admiral*, Broadley*, Sway*.
SZ 39: Norley*.
SU 10: St. Leonards*, Barnsfield Heath, Matcham's*, Week Wood*, Picket Hill, Little Linford.
SU 11: Sandy Balls Wood, Godshill, Hasley, Broomy*.
SU 20: Roe Wood, Milkam, Holmsley, Burley*, Oakley, Slufter's*, Wilverley, Anderwood, Mark Ash, Bolderwood, Knightwood, Holmhill, Highland Water, Rhinefield, Vinney Ridge*, Holidays Hill, Poundhill*, New Park*, Lyndhurst.
SU 21: Milkam*, Broomy, Sloden, Amberwood, Island Thorns, Minstead.
SU 30: Denny, Brockenhurst*, Ramnor, Ladycross*, Stockley*, Perrywood Haseley*, Beaulieu.
SU 31: Busketts Wood*.
SU 40: Exbury*.
SU 41: Southampton, Eastleigh, College Woods, West End, Chilworth Common*.
SU 42: Ampfield*, Chandler's Ford.
SU 51: Wickham*, Quob, Biddenfield, Swanmore.

North Hampshire

SU 42: Crab Wood.
SU 44: Harewood Forest†.
SU 64: Spring Woods†, Tunworth†.
SU 66: Pamber Forest*, Mortimer West End*.
SU 73: Whitehill*.
SU 74: Long Sutton*.
SU 75: Hartley Wintney, Fleet*, Hartfordbridge*.
SU 76: Bramshill*.
SU 83: Woolmer Forest, Headley*.
SU 85: Fleet*, Rushmore Arena*, Hawley, Farnborough.

West Sussex

SU 72: Durford Wood†.
SU 80: Ashling Wood†.
SU 82: Harting Combe, Rake*, Langley*, Midhurst, Easebourne*.
SU 91: Graffham, Ambersham Common*.
TQ 01: Fittleworth*, Coldwaltham, Greatham*, Pulborough, Storrington.
TQ 22: Crabtree*.

East Sussex

TQ 22: Bolney Woods†.
TQ 23: Tilgate Forest*, Worth Forest.
TQ 30: Brighton†.
TQ 33: Balcombe*, Worth Forest, Horncastle Wood.
TQ 42: Newick*, Piltdown*.

TQ 43: Press Ridge Warren, Wych Cross, Hindleap Warren*, Broadstone Wood, Crowborough*.
TQ 50: Abbot's Wood*.
TQ 52: Cross-in-Hand, Heathfield*.
TQ 53: Groombridge*, Eridge Forest, Broadwater Forest*.
TQ 62: Brightling*.
TQ 63: Bell's Yew Green*, Hawkenbury*.
TQ 70: Bexhill*.
TQ 71: Battle*.
TQ 72: Vinehall*.
TQ 81: Hastings, Guestling Wood*.
TQ 82: Beckley*.

East Kent

TQ 83: Benenden, Biddenden*.
TQ 86: Wigmore†, Rochester†, Rainham Park†, Guildsted Woods†.
TQ 93: Woodchurch*.
TQ 95: Wichling, Huntingfield, Throwley, Stalisfield*, Milsted*.
TR 04: Challock*.
TR 05: Challock*, Lyminge*.
TR 06: Blean Wood*, Whitstable*.
TR 14: Elham*, Barham*.
TR 15: Denge Wood*, Upper Hardes*, Chartham Hatch*, Trenley Park Wood*.
TR 16: Westbere, Herne Bay, Pear Hill*, Blean*, Clowes Wood*, Shrub Hill*.
TR 24: Elms Vale*.

West Kent

TQ 45: Westerham, Brasted*.
TQ 47: Woolwich†, Bexley Heath*.
TQ 54: Chiddingstone†.
TQ 55: Seal Chart*, Raspit Hill, Oldbury*, Ivy Hatch*.
TQ 57: Darenth Wood†, Swanscombe, Joyden's Wood*, Greenhithe†.
TQ 64: Pembury Wood*.
TQ 65: Platt, West Peckham*.
TQ 73: Bedgebury Park*, Hawkhurst, Cranbrook*, Flimwell*.
TQ 75: Maidstone†.
TQ 76: Chatham, Rochester, Hempstead Woods, Bredhurst*.
TQ 77: Chattenden Wood†.

Surrey

SU 84: Farnham*, Tilford*, Bourne*, Crooksbury*.
SU 85: Ash Vale*, Frimley*.
SU 93: Witley*, Chiddingfold*.
SU 94: Thursley*, Milford, Elstead.
SU 95: Frith Hill*.
SU 96: Bagshot, Chobham*, Longcross*, Brimshot*, Virginia Water*, Fort Belvedere*.
TQ 04: Shere, Blackheath*, Winterfold Forest*.
TQ 05: Pyrford, Woking, Wisley Common, Ockham Common*.
TQ 06: Horsell Common*, Weybridge Heath*, St. George's Hill, Byfleet, Sheerwater*.
TQ 14: Holmbury*.
TQ 15: Ashtead†.
TQ 16: Esher Common, Cobham, Oxshott Heath*.
TQ 24: Reigate†.
TQ 34: Felcourt Heath†.
TQ 37: Catford†.
TQ 45: Limpsfield*.

South Essex

TQ 38: Walthamstow†.
TQ 49: Epping Forest†.
TQ 69: Billericay*, Brentwood*.
TQ 88: Leigh-on-Sea, Southend, Hadleigh*.
TQ 89: Hockley*.
TL 70: Lingwood Common, Little Baddow*, Woodham Walter Common*.

North Essex

TL 81: Wickham Bishops*.
TM 02: Colchester†.

Middlesex

TQ 19: Stanmore*.
TQ 28: Hampstead†, Kensington Gardens†, Highgate†.
TQ 39: Winchmore Hill†, Enfield†.
TQ 48: Wanstead†.

Berkshire

SU 49: Kingston Bagpuize†, Tubney*.
SU 57: Bradfield†.
SU 66: Aldermaston Park, Mortimer, Burghfield, Padworth*, Ufton Park*.
SU 86: Wokingham, Wellington College, Crowthorne*, Caesar's Camp*, Lower Star Post, Penny Hill, Swinley, Finchampstead*, Easthampstead Wood*, Ninemile Ride*, Heathlands*, Little Sandhurst*.
SU 87: Great Hazes*.
SU 96: Ascot, Burleigh*.
SU 97: Windsor Great Park†.
SP 40: Triangle Plantation*.

Oxford

SU 67: Mapledurham†, Caversham†.
SP 50: Shotover†.
SP 51: Elsfield†.

Buckingham

SU 98: Stoke Green, Burnham Beeches*.
SP 61: Shabbington*.
SP 93: Bow Brickhill*.

East Suffolk

TM 13: Bentley Wood†, Holbrook Park†.

West Suffolk

TL 93: Assington Thicks†.

Cambridge

TL 25: Gamlingay†.

Bedford

TL 03: Maulden*, Clophill*.

Northampton

SP 76: Harlestone*.
TL 09: Thornhaugh*.
TF 10: Helpston Heath*

East Gloucester

SO 80: Stonehouse, Woodchester, Slad Valley, Golden Valley, Chalford*.
SO 81: Sheepscombe†.
SO 90: Sapperton, Daglingworth*, Cirencester Park.
SO 91: Birdlip†.
SO 92: Cheltenham†.

West Gloucester

ST 79: Dursley*, Stinchcombe Hill, Wotton-under-Edge*, Pipley Bottom*.
SO 51: Symonds Yat, Coldwell Rocks, Lower Staunton*.
SO 60: Lydney*.
SO 61: Dean Forest, Speech House*.
SO 62: Baileybrook*, Much Marcle*, Dymock Wood*, Mitcheldean Station, Gorsley.
SO 71: Westbury†.
SO 72: Newent Woods*.

Monmouth

ST 49: Penhow, Went Wood*, Chepstow Park Wood*.
ST 59: St. Pierre's Great Wood*.
SO 50: Trelleck Common*, Llandogo, Tintern, Whitebrook*.

Hereford

SO 37: Buckton*.
SO 51: Great Doward Hill*.
SO 53: Mordiford*.
SO 63: Stoke Edith, Woolhope*.
SO 73: Hollybush Hill†.

Worcester

SO 77: Bewdley, Ribbesford Woods*, Eymore Wood*, Seckley Wood*, Wyre Forest*.
SO 86: Shrawley†.
SO 95: Trench Wood*.

Warwick

SP 08: Edgbaston†.
SP 19: Sutton Coldfield†.
SP 27: Hay Wood*.

Stafford

SJ 73: Eccleshall†.
SJ 93: Moddershall*.
SK 01: Cannock Chase†.
SK 10: Tamworth*.

Shropshire

SO 38: Walcot*.
SO 69: Shirlett†, Bridgenorth†.
SO 77: Wyre Forest*.
SJ 40: Lyth Hill†.
SJ 60: Farley Common†, Broseley†.

Glamorgan

SS 69: Swansea†.
SS 79: Baglan†, Briton Ferry†
ST 17: Cwrt-yr-ala†, Cardiff†.
ST 18: Taff's Well†, Castell Coch†, Brynau Valley†.
ST 28: Rudry*.
SN 90: Pontneath-Vaughan†.

Brecon

SN 91: Ystradfellte†.

Radnor

SN 96: Elan Valley*.
SO 25: Stanner Rocks*.

Cardigan

SN 69: Furnace*.
SN 77: Devil's Bridge, Rheidol Valley*.

Montgomery

SN 79: Llyfnant Valley, Machynlleth*.
SN 98: Llanidloes*.

Merioneth

SH 50: Towyn.
SH 61: Barmouth*, Fairbourne*, Bontddu*.

Carnarvon

SH 75: Glyn*.
SH 76: Trefriw*.

Denbigh

SJ 24: Llangollen†.

North Lincoln

SK 97: Skellingthorpe†.
TF 16: Woodhall Spa†.
TF 25: Tumby*, Coningsby†, Troy Wood*.
TF 26: Troy Wood*.

Leicester

SK 50: Charnwood Forest†.
SK 51: Out Woods†, Buddon Wood*.

Nottingham

SK 55: Sherwood Forest†, Mansfield†.
SK 87: Wigsley Wood*, Thorney Wood†.

Cheshire

SJ 57: Delamere Forest†.
SJ 78: Dunham Park†.

Mid Lancashire

SD 47: Silverdale, Warton Woods*, Carnforth.

South West Yorkshire

SE 41: Wentbridge*.

South Northumberland

NY 95: Blanchland*.

North Lancashire

SD 37: Old Park Wood*, Ellerside Breast*, Holker Hall.
SD 38: Windermere†, Blackbarrow†, Newby Bridge†, Lake Side†, Haverthwaite*.
SD 39: Satterthwaite†, Claife†, High Wray†.
SD 47: Eggerslack Wood*, Yew Barrow*, Blawith Fell*, Grange-over-Sands*.
NY 30: Ambleside*, Hawkshead*.

Westmorland

SD 47: Arnside*, Middlebarrow Wood*, Grizedale Wood*, Gait Barrows*, Cringlebarrow Wood*, Trough Plantation*.
SD 48: Limegarth Wood*, Meathop Fell*, Park Wood*, High Crag Wood*, Witherslack*.
SD 49: Bowness†.
NY 61: Appleby*.

Cumberland

NY 22: Bassenthwaite*.
NY 34: Parkhead, Caldbeck*.

Footnote

Localities recorded or confirmed since 1950 marked *.
Previously recorded localities not confirmed since 1950 marked †.
Previously recorded localities but present status unknown are unmarked.

TABLE 2

Summary of distribution and status of *Formica rufa* L. in England and Wales

Vice-County	*Present status*	*Number of 10 kilometre squares* Recorded	Confirmed	Extinct	*Status unknown*
1. W. Cornwall	Confirmed	1	1	0	0
2. E. Cornwall	Confirmed	2	2	0	0
3. S. Devon	Confirmed	17	14	1	2
4. N. Devon	Confirmed	3	1	0	2
5. S. Somerset	Confirmed	6	4	1	1
6. N. Somerset	Confirmed	6	3	3	0
7. N. Wilts.	Extinct	3	0	3	0
8. S. Wilts.	Confirmed	3	2	1	0
9. Dorset	Confirmed	12	10	2	0
10. Isle of Wight	Confirmed	6	3	2	1
11. S. Hants.	Confirmed	14	14	0	0
12. N. Hants.	Confirmed	10	7	2	1
13. W. Sussex	Confirmed	6	4	2	0
14. E. Sussex	Confirmed	16	14	2	0
15. E. Kent	Confirmed	11	10	1	0
16. W. Kent	Confirmed	11	8	3	0

TABLE 2 (*continued*)

Vice-County	*Present status*	*Recorded*	*Confirmed*	*Extinct*	*Status unknown*
17. Surrey	Confirmed	16	12	4	0
18. S. Essex	Confirmed	6	4	2	0
19. N. Essex	Confirmed	2	1	1	0
20. Herts.	Not recorded	0	0	0	0
21. Middlesex	Confirmed	4	1	3	0
22. Berks.	Confirmed	8	6	2	0
23. Oxford	Extinct	3	0	3	0
24. Bucks.	Confirmed	3	3	0	0
25. E. Suffolk	Extinct	1	0	1	0
26. W. Suffolk	Extinct	1	0	1	0
27. E. Norfolk	Not recorded	0	0	0	0
28. W. Norfolk	Not recorded	0	0	0	0
29. Cambridge	Extinct	1	0	1	0
30. Bedford	Confirmed	1	1	0	0
31. Hunts.	Not recorded	0	0	0	0
32. Northants.	Confirmed	3	3	0	0
33. E. Glouc.	Confirmed	5	2	3	0
34. W. Glouc.	Confirmed	7	6	1	0
35. Monmouth	Confirmed	3	3	0	0
36. Hereford	Confirmed	5	4	1	0
37. Worcester	Confirmed	3	2	1	0
38. Warwick	Confirmed	3	1	2	0
39. Stafford	Confirmed	4	2	2	0
40. Shropshire	Confirmed	5	2	3	0
41. Glamorgan	Confirmed	6	1	5	0
42. Brecon	Extinct	1	0	1	0
43. Radnor	Confirmed	2	2	0	0
44. Carmarthen	Not recorded	0	0	0	0
45. Pembroke	Not recorded	0	0	0	0
46. Cardigan	Confirmed	2	2	0	0
47. Montgomery	Confirmed	2	2	0	0
48. Merioneth	Confirmed	2	1	0	1
49. Carnarvon	Confirmed	2	2	0	0
50. Denbigh	Extinct	1	0	1	0
51. Flint	Not recorded	0	0	0	0
52. Anglesey	Not recorded	0	0	0	0
53. S. Lincoln	Not recorded	0	0	0	0
54. N. Lincoln	Confirmed	4	2	2	0
55. Leicester	Confirmed	2	1	1	0
56. Nottingham	Confirmed	2	1	1	0
57. Derby	Not recorded	0	0	0	0
58. Cheshire	Extinct	2	0	2	0
59. S. Lancs.	Not recorded	0	0	0	0
60. Mid Lancs.	Confirmed	1	1	0	0
61. S.E. York	Not recorded	0	0	0	0
62. N.E. York	Not recorded	0	0	0	0
63. S.W. York	Confirmed	1	1	0	0
64. M.W. York	Not recorded	0	0	0	0
65. N.W. York	Not recorded	0	0	0	0
66. Durham	Not recorded	0	0	0	0
67. S. Northumberland	Confirmed	1	1	0	0
68. N. Northumberland	Not recorded	0	0	0	0
69a. N. Lancs.	Confirmed	5	4	1	0
69b. Westmorland	Confirmed	4	3	1	0
70. Cumberland	Confirmed	2	2	0	0
71. Isle of Man	Not recorded	0	0	0	0

TABLE 3

Distribution and status of *Formica rufa* L. on main geological substrates of England and Wales

	Number of 10 kilometre squares in vice-counties			
	Recorded	*Confirmed*	*Extinct*	*Status unknown*
Sand				
Headon and Bovey	8	7	1	0
Bagshot	38	36	1	1
Oldhaven	11	7	3	1
Lower Greensand	24	18	6	0
Hastings	20	17	3	0
Corallian	5	2	3	0
Northampton	3	3	0	0
Totals	109	90	17	2
Clay				
London	17	7	10	0
Gault	3	0	1	2
Weald	3	3	0	0
Oxford	2	1	1	0
Lower Lias	6	2	4	0
Middle Lias	1	1	0	0
Keuper Marl	7	2	5	0
Totals	39	16	21	2
Calcareous				
Chalk	17	9	7	1
Carboniferous	17	13	4	0
Magnesian	1	1	0	0
Great Oolite	5	4	1	0
Inferior Oolite	4	2	2	0
Totals	44	29	14	1
Non-Calcareous and Unclassified				
Coal Measures	6	2	4	0
Millstone Grit	8	7	1	0
Devonian	20	15	1	4
Sandstone	5	4	1	0
Keuper Sandstone	2	0	2	0
Bunter Sandstone	6	2	4	0
Granite	2	2	0	0
Norwich Crags	1	0	1	0
Wenlock	1	1	0	0
Ludlow	5	2	3	0
Tarannon and Llandovery	5	5	0	0
Ashgill, Caradoc, Llandeilo	3	2	0	1
Slate and Flags	3	3	0	0
Igneous	1	1	0	0
Cambrian	1	1	0	0
Totals	69	47	17	5

TABLE 4

References to published distribution of *Formica rufa* L. in counties of England and Wales

Bedford: Barrett, 1964a; Chambers, 1949.
Berkshire: Barrett, 1964, 1967; Donisthorpe, 1935, 1936; Nelmes, 1938; Yarrow, 1955.
Brecon: Nelmes, 1938.
Buckingham: Barrett, 1964, 1964a, 1967; Chambers, 1949; Nelmes, 1938.

Cambridge: Ing, 1960; Nelmes, 1938.
Cardigan: Richards, 1944.
Carnarvon: Collingwood, 1961.
Cheshire: Nelmes, 1938.
Cornwall: Collingwood, 1966; Nelmes, 1938; Nicholson, 1935.
Cumberland: Satchell and Collingwood, 1955; Yarrow, 1955.

Denbigh: Yarrow, 1955.
Devon: Barrett, 1964, 1964a, 1965; Nelmes, 1938; Yarrow, 1955.
Dorset: Barrett, 1964a; Collingwood, 1954; Dale, 1878; Fraser, 1959; Morley, 1938; Nelmes, 1938; Nevinson, 1905; Yarrow, 1939, 1955.

Essex: Barrett, 1964a, 1964, 1965; Barrett and Felton, 1965; Donisthorpe, 1927a; Nelmes, 1938; Yarrow, 1955.

Glamorgan: Kloet, 1941; Nelmes, 1938; Yarrow, 1955.
Gloucester: Barrett, 1965; Collingwood, 1955, 1958; Donisthorpe, 1933; Nelmes, 1938; Yarrow, 1955.

Hampshire: Barrett, 1964, 1964a, 1965; Brangham, 1937; Morley, 1939, 1939a; Nelmes, 1938; Yarrow, 1955.
Hereford: Barrett, 1965; Collingwood, 1955; Nelmes, 1938; Yarrow, 1955.

Kent: Barrett, 1964, 1964a; Barrett and Felton, 1965; Chitty, 1902; Felton, 1963, 1967; Marriott, 1925; Nelmes, 1938; Yarrow, 1955.

Lancashire: Butler, 1956; Satchell and Collingwood, 1955; Yarrow, 1955.
Leicester: Collingwood, 1957; Nelmes, 1938.
Lincoln: Collingwood, 1957; Graham, 1941; Nelmes, 1938.

Merioneth: Kloet, 1941; Nelmes, 1938; Yarrow, 1955.
Middlesex: Barrett, 1964a; Barrett and Felton, 1965; Donisthorpe, 1943; Guichard and Yarrow, 1947; Nelmes, 1938; Yarrow, 1954, 1955.
Monmouth: Barrett, 1965; Collingwood, 1957; Nelmes, 1938; Yarrow, 1955.
Montgomery: Collingwood, 1962; Richards, 1944.

Northampton: Collingwood, 1958; Nelmes, 1938.
Northumberland: Collingwood, 1956.
Nottingham: Collingwood, 1957; Nelmes, 1938.

Oxford: Barrett, 1968; Nelmes, 1938; Richards, 1939; Yarrow, 1955, 1956.

Radnor: Collingwood, 1955.

Shropshire: Collingwood, 1955; Nelmes, 1938.
Somerset: Barrett, 1964, 1964a; Collingwood, 1956, 1966; Morley, 1939; Nelmes, 1938; Yarrow, 1955.
Stafford: Collingwood, 1955; Nelmes, 1938.
Suffolk: Barrett, 1965; Nelmes, 1938.
Surrey: Barrett, 1964, 1964a, 1965; Barrett and Felton, 1965; Donisthorpe, 1935; Lousley, 1939; Nelmes, 1938; Yarrow, 1955.
Sussex: Barrett, 1964, 1964a, 1965; Barrett and Felton, 1965; Butler, 1943; Nelmes, 1938; Wood-Baker, 1964; Yarrow, 1955.

Warwick: Collingwood, 1955; Nelmes, 1938; Yarrow, 1955.
Westmorland: Satchell and Collingwood, 1955; Yarrow, 1955.
Wight, Isle of: Barrett, 1964; Jeffery, 1931; Nelmes, 1938; Yarrow, 1955.
Wiltshire: Barrett, 1968 Collingwood, 1961, 1966; Nelmes, 1938.
Worcester: Collingwood, 1955; Nelmes, 1938.

Yorkshire: Collingwood, 1956.

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